Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Petition for Rulemaking: Amendment of	)	CG RM-11844
Rules Governing Ultra-Wideband Devices	)	
and Systems	)	

Reply Comments of Zebra Technologies, Inc.

Zebra Technologies, Inc., ("Zebra"), is pleased to submit these reply comments in response to the petition for rulemaking regarding rules governing Ultra-Wideband ("UWB") devices and systems, made by Robert Bosch LCC[1] ("Bosch"), and comments filed in response to that petition.

1. Background

Zebra produces and deploys the Dart system ("Dart"), which utilizes UWB technology as certified under FCC part 15.250. Dart is a real-time locating system ("RTLS") and is deployed into a variety of markets, including manufacturing, safety, and professional sports. Dart consists of small, autonomous, battery-operated, transmitting "tags", along with a set of receivers placed throughout a facility. Receiving infrastructure may be installed either indoors or outdoors. Typically, receivers covering an outdoor space are placed around a perimeter with antennas of modest gain facing toward the covered region. The location of the tags is determined to sub-1 ft accuracy by calculations based on the times of reception of short packet bursts from the tags at the various receivers. Dart tags are extremely power-efficient and can transmit continuously for several years at intervals of one second or even less.

Zebra's Dart systems are an integral part of production processes at numerous large industrial settings across the United States. Dart is used for tracking thousands of tools at multiple airliner assembly facilities. Zebra's UWB solution is also used to ensure worker safety at 6 aircraft painting facilities, finishing dozens of commercial airliners each quarter. In yet another application, the production of 25,000 automobiles per month is streamlined by the tracking of more than 1000 different automated tools.

Additionally, Dart has been used for real-time player tracking in the National Football League (NFL) for the last five years and continues to be used in this current season. The system has been used for the last three seasons to track every player at every venue for every game. Dart tags are installed in all NFL player shoulder pads and footballs. The position data along with derived motion information has revolutionized professional football, by enabling in-depth performance analysis and live broadcast enhancement.

---

[1] Robert Bosch LLC, Petition for Rulemaking, 18 Jun 2019, CG RM-11844

2. Zebra's Reply Comments

These reply comments are specifically in response to comments filed by:

- The Ultra Wide Band Alliance[2] ("UWB Alliance"),
- Michael McLaughlin[3] ("Decawave"),
- InnoTec21 GmbH[4], ("InnoTec21"),
- ZIGPOS GmbH[5] ("ZIGPOS"),
- Novelda US Inc[6] ("Novelda"),
- Vayyar Imaging Ltd[7], ("Vayyar"),
- Piper Networks, Inc.[8] ("Piper"),
- Vortezon, Inc[9], ("Vortezon"), and
- IEEE 802 LAN/MAN Standards Committee[10] ("IEEE"), and
- Robert Bosch LLC[11] ("Bosch")

Zebra supports the Bosch request, and in general agrees with the amplifying comments from the filers above requesting a thorough review of rules regulating UWB products.

In particular, Zebra echoes the comments made by all of the above filers that the FCC should consider removal of the restriction on fixed outdoor use of UWB. The original concerns regarding the formation of high-speed networks seem to be overly restrictive. Many RTLS systems, for example, can be greatly enhanced by having "beacons" in known locations which occasionally transmit a short packet. Furthermore, the FCC should clarify the meaning of "fixed infrastructure". For example, it isn't clear if a small, battery-operated, transmit-only tag tie-wrapped to a fencepost would be considered "fixed".

Also, as noted by Decawave and Vayyar, Zebra concurs that the requirement in 15.519 for acknowledgement within 10 sec should be removed/re-evaluated. Likewise, Zebra agrees that the requirement for handheld operation be reconsidered. RTLS applications require the deployment of small transmit-only tags which must conserve power by transmitting short packets relatively infrequently. Since 15.519 already allows outdoor operation within some operational constraints, the concerns regarding interference are evidently not overwhelming. As suggested by Vayyar and Bosch, Zebra agrees that other combinations of mitigations might be possible, and that such mitigations need not be applied uniformly across the entire 3.1 to 10.6 GHz range.

---

[2] Ultra Wide Band (UWB) Alliance, 15 Aug 2019, CG RM-11844

[3] Michael McLaughlin, 16 Aug 2019, CG RM-11844

[4] InnoTec21 GmbH, 16 Aug 2019, CG RM-11844

[5] ZIGPOS GmbH, 19 Aug 2019, CG RM-11844

[6] Novelda US Inc, 19 Aug 2019, CG RM-11844

[7] Vayyar Imaging Ltd., 19 Aug 2019, CG RM-11844

[8] Piper Networks, Inc., 19 Aug 2019, CG RM-11844

[9] Vortezon, Inc., by Peter T. Lewis President & CEO, 19 Aug 2019, CG RM-11844

[10] IEEE 802 LAN/MAN Standards Committee, 23 Aug 2019, CG RM-11844

[11] Robert Bosch LLC, 19 Aug 2019, CG RM-11844

As stated in many of the filings, Zebra confirms the assertion that in our experience UWB equipment does not cause interference to licensed incumbents.

Zebra also encourages the FCC to explore the UWB Alliance recommendation (Section 5 "Incremental Opportunity") to allow frequency and time diversity to be considered when determining occupied bandwidth.

As most of these parties commented, the FCC stated their intention to revisit the UWB rules in the first year after issuance. Zebra agrees that with the accumulation of 17 years of real-world experience with no known cases of interference to incumbents, the time has come for a thorough review of those UWB rules.

Respectfully submitted,
Zebra Technologies, Inc.

By:

Carl S. Mower
Sr. Director of Engineering
Location Solutions
Zebra Technologies Inc.

August 30, 2019